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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application:	Hoffmann, Shlomo
Serial No.:	09/820,146
Filed:	03/28/2001
Group Art Unit:	2634
Examiner:	Ha, Dac V.
For:	INTERMODULATION DISTORTION IDENTIFICATION AND QUANTIZATION CIRCUIT FOR A LINEAR AMPLIFIER SYSTEM

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Appellant filed a Notice of Appeal on July 21, 2005. Applicant now submits its brief. A check in the amount of $620.00 is enclosed, which includes a one month extension fee. The Commissioner is authorized to charge Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds for any additional fees or credit the account for any overpayment.

Introduction

The §103 rejection that is the subject of this appeal must be reversed because there is no *prima facie* case of obviousness. There is no motivation for making the combination proposed by the Examiner because there is no benefit provided by the combination. Therefore, the combination cannot be made. Further, even if it were possible to make the combination, the result is not the same as the claimed invention.

Real Party in Interest

Lucent Technologies, Inc. is the real party in interest.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of the Claims

Claims 1-25 stand rejected under 35 U.S.C. §103.

Status of Amendments

There are no unentered amendments.

Summary of Claimed Subject Matter

This invention generally relates to processing video frequency signals in wireless communication systems. This invention includes a unique approach to eliminating intermodulation distortion.

There are four independent claims, which read as follows:

1. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:
sampling the output of a multiple carrier linear amplifier radio frequency signal; and
detecting the sampled signal at frequency increments and quantizing and nulling the intermodulation distortion.

8. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:
sampling the output of a multiple carrier linear amplifier radio frequency signal;
generating a local oscillator signal having predetermined frequency increments $f_o \ldots f_i$ situated in at least one of predetermined sub-bands;

mixing the sampled radio frequency signal with the local oscillator signal to target the centers of the multiple carriers and generate an intermediate frequency signal; and

detecting and digitizing the intermediate frequency signal for quantization and nulling of the intermodulation distortion.

16. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:

sampling the output of a multiple carrier linear amplifier radio frequency signal;

generating a local oscillator signal having predetermined frequency increments $f_o \ldots f_i$ situated in at least one of predetermined sub-bands;

mixing the sampled radio frequency signal with the local oscillator signal for targeting the centers of the multiple carriers and generating an intermediate frequency signal, said step of mixing further comprising the step of stepping local oscillator frequency increments f_o to f_1, comparing the outputs of the stepping operation to identify sub-bands, determining which sub-bands are active, and adjusting local oscillator frequency based on the determined active frequencies.

23. A multiple carrier linear amplifier circuit having reduced intermodulation distortion comprising:

balanced amplifier circuits for processing a multiple carrier linear amplifier radio frequency signal; and

an intermodulation distortion identification and quantization circuit connected to said balanced amplifier circuits for receiving a sampled radio frequency signal; and

a detector circuit for detecting the sampled frequency circuit for quantization and nulling the intermodulation distortion.

The example embodiment in the description includes a flow chart in Figure 10 where frequency increments in the sampled signal are used at 200 and detected at 202. Intermodulation distortion controls are adjusted at 238 for nulling intermodulation distortion. The example circuit of Figure 3 includes a synthesizer 106 for generating a local oscillator signal having the desired frequency increments. A mixer 108 mixes the sampled radio frequency signal with the local oscillator signal. The example of Figure 3 includes a sample and hold circuit 130 and an analog to digital converter 142 for detecting and digitizing so that a DSP 120 can accomplish nulling intermodulation distortion.

Grounds of Rejection to Be Reviewed on Appeal

Claims 1-25 were rejected under 35 U.S.C. §103 based upon a proposed combination of U.S. Patent No. 6,259,319 (the *Ghanadan, et al.* reference) and U.S. Patent No. 5,937,011 (the *Carney* reference).

Argument

There is no *prima facie* case of obviousness. There is no legal motivation for making the proposed combination of the *Ghanadan, et al.* and *Carney* references as discussed below. Even if the combination could be made, the result is not the same as any of Applicant's claims.

It is axiomatic that there must be a sufficient legal motivation from within the art to make a combination in order to establish a *prima facie* case of obviousness. Where there is no motivation, there is no *prima facie* case of obviousness. In this instance, there is no motivation for modifying the *Ghanadan, et al.* reference by including an amplifier from the *Carney* reference as suggested by the Examiner. Where a proposed combination does not provide any benefit (e.g., merely includes a redundant feature or otherwise does not enhance the arrangement in the primary reference), there is no motivation for making the combination. Here, there is no motivation because the proposed addition or substitution of the amplifier of the *Carney* reference into the arrangement of the *Ghanadan, et al.* reference does not provide any benefit for the arrangement of the *Ghanadan, et al.* reference.

The Examiner begins by ascribing a feature to the *Ghanadan, et al.* reference that does not exist in that reference. The Examiner suggests that the *Ghanadan, et al.* reference includes quantizing and nulling an intermodulation distortion by sampling the output of an amplifier radio

frequency signal and detecting the sample signal. Applicant respectfully disagrees. The *Ghanadan, et al.* reference does not teach that.

In the *Ghanadan, et al.* reference, the technique for dealing with intermodulation distortion includes adding a pilot signal to a signal of interest. Then the pilot signal can be detected for identifying intermodulation distortion. The *Ghanadan, et al.* reference includes adding an inverse of the intermodulation distortion to the signal in an attempt to eliminate the intermodulation distortion. It is worth noting that that is not the same as sampling the output of an amplifier and using frequency increments, digitizing and nulling as Applicant claims.

The *Ghanadan, et al.* reference includes the teachings of Figure 4 for correcting an "error" signal that corresponds to a difference between the inverse that is added to the received signal of interest in an attempt to eliminate the intermodulation distortion and what is actually required to eliminate the intermodulation distortion. The subject matter in Figure 4 modifies a phase or gain based upon the error which corresponds to a failure to eliminate the distortion (i.e., the difference between the actual intermodulation distortion and the additional component added that is supposed to eliminate or cancel the intermodulation distortion).

The Examiner properly acknowledges that *Ghanadan, et al.* does not include a multiple carrier linear amplifier. The Examiner then seems to draw that from the *Carney* reference and proposes to "utilize method multi-carrier signaling of *Carney* into *Ghanadan, et al.* to maximize the utilization of *Ghanadan, et al.* system." Applicant believes that what the Examiner is proposing is to insert a multiple carrier linear amplifier from *Carney* (HPA 18) into the arrangement of *Ghanadan, et al.* Although it is not clear where the Examiner proposes to make the substitution or exactly how, it appears that it would have to be a mere substitution of one amplifier for another.

That does not provide any benefit to the *Ghanadan, et al.* arrangement and, therefore, there is no motivation for making such a modification.

There would be no benefit to adding the HPA 18 of the *Carney* reference to the *Ghanadan, et al.* reference. If one made that substitution, there would simply be a different amplifier. It has no impact on the operation of the arrangement in the *Ghanadan, et al.* reference in a manner that could provide any benefit. Therefore, there is no motivation for making the substitution and the combination cannot be made.

If one were to add the HPA 18 from the *Carney* reference to the *Ghanadan, et al.* reference, the processing would be the same and there would only be a different amplifier. Simply putting in a different amplifier does not have any benefit or change the results provided by *Ghanadan, et al.* in any way and, therefore, there is no benefit to making the combination.

Additionally, even if the combination could somehow be made, it is not the same as what is claimed. Neither of the *Ghanadan, et al.* or the *Carney* references detect a sampled signal, which is the output of a multiple carrier linear amplifier, utilize frequency increments and digitizing or quantizing and nulling intermodulation distortion as claimed. *Ghanadan, et al.* never uses frequency increments, digitizes or quantizes for nulling intermodulation distortion. At best, the arrangement in Figure 4 of the *Ghanadan, et al.* reference digitizes information regarding the "error" signal of that reference. Even if one adds the HPA 18 from *Carney, et al.*, that does not change the approach in *Ghanadan, et al.* in a manner that makes it consistent with Applicant's claimed invention. There is nothing within either reference that uses frequency increments in a manner consistent with Applicant's claims. The *Ghanadan, et al.* reference (and if it could be modified by the *Carney* reference, the resulting combination) uses a feed forward technique to cancel distortion in an entire signal, which is not the same as using frequency increments and

quantizing a signal into discrete components and nulling distortion associated with the components. Therefore, even if the combination could somehow be made, the result is not the same as any of Applicant's claims.

Many of Applicant's claims include additional limitations that cannot be found anywhere within the proposed combination of references.

The Examiner' proposed addition of *Meyer* (U.S. Patent No. 6,157,254) does nothing to remedy the defect in the proposed base combination of the *Ghanadan, et al.* and *Carney* references. Therefore, the rejection under 35 U.S.C. §103 applied to claims 8-22, 24 and 25 does not establish a *prima facie* case of obviousness any more than the rejections based upon the combination of the *Ghanadan, et al.* and *Carney* references.

In rejecting claims 2-7, 9-15 and 17-22, the Examiner merely states, "these claimed subject matter are rather design specific, thus would have been obvious to one skilled in the art." That does not establish a *prima facie* case of obviousness. There is no basis for rejecting those claims provided by the Examiner. Applicant expressly disagrees with the Examiner's conclusion.

All claims are allowable and the rejections under 35 U.S.C. §103 must be reversed.

Respectfully submitted,

CARLSON, GASKEY & OLDS, P.C.

October 21, 2005
Date

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CERTIFICATE OF MAIL

I hereby certify that the enclosed **Appeal Brief and Fees** is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Mail Stop Appeal Brief - Patents, Commissioner For Patents, P. O. Box 1450, Alexandria, VA 22313-1450 on October 21, 2005.

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Theresa M. Palmateer

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.

APPENDIX OF CLAIMS

1. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:

sampling the output of a multiple carrier linear amplifier radio frequency signal; and

detecting the sampled signal at frequency increments and quantizing and nulling the intermodulation distortion.

2. A method according to Claim 1,and further comprising the step of determining active sub-bands by scanning a plurality of carriers corresponding to frequency increments above a threshold, and establishing the carrier as an active sub-band.

3. A method according to Claim 2, and further comprising the steps of generating a local oscillator signal having predetermined frequency increments $f_o \ldots f_i$ situated in at least one of the sub-bands.

4. A method according to Claim 3, and further comprising the steps of mixing the sampled radio frequency signal with the local oscillator signal to target the centers of the multiple carriers and generate an intermediate frequency signal.

5. A method according to Claim 4, and further comprising the step of filtering the resultant intermediate frequency signal before detecting and digitizing for quantization.

6. A method according to Claim 5, and further comprising the step of stepping local oscillator frequency increments f_o to f_i, and comparing the outputs of the stepping operation to identify sub-bands.

7. A method according to Claim 6, and further comprising the step of determining which frequencies are active in which sub-bands and adjusting the local oscillator frequency based on the determined active frequencies.

8. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:

sampling the output of a multiple carrier linear amplifier radio frequency signal;

generating a local oscillator signal having predetermined frequency increments $f_o \ldots f_i$ situated in at least one of predetermined sub-bands;

mixing the sampled radio frequency signal with the local oscillator signal to target the centers of the multiple carriers and generate an intermediate frequency signal; and

detecting and digitizing the intermediate frequency signal for quantization and nulling of the intermodulation distortion.

9. A method according to Claim 8, and further comprising the step of filtering the resultant intermediate frequency signal before detecting and digitizing for quantization.

10. A method according to Claim 8, and further comprising the step of stepping local oscillator frequency increments f_o to f_i, and comparing the outputs of the stepping operation to identify sub-bands.

11. A method according to Claim 8, and further comprising the step of determining which frequencies are active in which sub-bands and adjusting the local oscillator frequency based on the determined active frequencies.

12. A method according to Claim 8, and further comprising the step of generating frequency increments $f_o \ldots f_{11}$ in 5 MHz increments.

13. A method according to Claim 8, and further comprising the step of generating the radio frequency signal in a radio frequency range from about 2110 to about 2170 MHz.

14. A method according to Claim 8, and further comprising the step of dividing the radio frequency signal into three sub-bands having up to four carriers.

15. A method according to Claim 8, and further comprising the step of detecting the intermediate frequency signal within a sample and hold circuit having a detector operative therewith.

16. A method of reducing intermodulation distortion within a linear amplifier comprising the steps of:

sampling the output of a multiple carrier linear amplifier radio frequency signal;

generating a local oscillator signal having predetermined frequency increments $f_o...f_i$ situated in at least one of predetermined sub-bands;

mixing the sampled radio frequency signal with the local oscillator signal for targeting the centers of the multiple carriers and generating an intermediate frequency signal, said step of mixing further comprising the steps of stepping local oscillator frequency increments f_o to f_i, comparing the outputs of the stepping operation to identify sub-bands, determining which sub-bands are active, and adjusting local oscillator frequency based on the determined active frequencies.

17. A method according to Claim 16, and further comprising the step of detecting and digitizing the intermediate frequency signal for quantization and nulling of the intermodulation distortion.

18. A method according to Claim 17, and further comprising the step of filtering the resultant intermediate frequency signal before detecting and digitizing for quantization.

19. A method according to Claim 16, and further comprising the step of generating frequency increments $f_o...f_{11}$ in 5 MHz increments.

20. A method according to Claim 16, and further comprising the step of generating the radio frequency signal in a radio frequency range from about 2110 to about 2170 MHz.

21. A method according to Claim 16, and further comprising the step of dividing the radio frequency signal into three sub-bands, each sub-band having up to four carriers.

22. A method according to Claim 16, and further comprising the step of detecting the intermediate frequency signal within a sample and hold circuit having a detector operative therewith.

23. A multiple carrier linear amplifier circuit having reduced intermodulation distortion comprising:

balanced amplifier circuits for processing a multiple carrier linear amplifier radio frequency signal; and

an intermodulation distortion identification and quantization circuit connected to said balanced amplifier circuits for receiving a sampled radio frequency signal; and

a detector circuit for detecting the sampled frequency signal for quantization and nulling the intermodulation distortion.

24. An amplifier according to Claim 23, wherein said detector and digitizing circuit further comprises a sample and hold circuit.

25. An amplifier according to Claim 24, and further comprising a synthesizer circuit for generating a local oscillator signal having predetermined frequency increments $f_o \ldots f_i$ situated within one of predetermined sub-bands and a mixer for mixing the sampled radio frequency signal with the local

oscillator signal and targeting the centers of multiple carriers.